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Website: https://etcor.org
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P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Pedagogical Approaches, Academic Grit, and Concept Mastery in Science among Grade 8 Students in the Division of Aklan: Basis for Learning Package in Science 8

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Received: 04 April 2025 **Revised**: 10 May 2025 **Accepted**: 12 May 2025

Available Online: 14 May 2025

Volume IV (2025), Issue 2, P-ISSN – 2984-7567; E-ISSN - 2945-3577

https://doi.org/10.63498/etcor321

Abstract

Aim: The study primarily assessed the levels of pedagogical approaches, academic grit, and concept mastery in Science among Grade 8 students in the Division of Aklan, which served as the basis for a learning package in Science 8.

Methods: This survey-correlational research design used a combined researcher-made and adopted questionnaire as tools in gathering data. Stratified random sampling and Raosoft software determined the sample size, which involved 369 out of 8,915 students, and insights from a focus group discussion with 10 Grade 8 students. Descriptive statistics used in the study were mean and standard deviation, and for inferential analyses were ANOVA, Pearson r, and linear regression with a 5% alpha level.

Results: The findings revealed that the overall level of pedagogical approaches in science, as perceived by Grade 8 students, was "highly evident," with the constructivist, collaborative, reflective, integrative, and inquiry-based approaches showing varying levels of efficacy. Academic grit in Science was also "highly evident," while concept mastery was at the "Approaching Proficiency" level. No significant differences were found between concept mastery and the levels of pedagogical approaches and academic grit. However, significant relationships were observed between pedagogical approaches, academic grit, and concept mastery in Science. Additionally, concept mastery was identified as a predictor for pedagogical approaches, while academic grit was not. The learning package developed based on these findings included a lesson plan, summative assessments, worksheets, and additional resources to enhance teaching and learning in Science.

Conclusion: The results confirmed that the level of pedagogical approaches in their science classes of teachers, as perceived by Grade 8 students, may result in developing and building their active learning techniques that are engaging and effective, such as group discussions, hands-on experiments, and problem-solving activities that might help them succeed in learning. In addition, the level of academic grit often results in students being intrinsically motivated to learn. These students are likely to take initiative in their studies, seek out additional resources when needed, and set personal academic goals, particularly in subjects they find difficult or complex, like science. On concept mastery in science 8, it may yield in helping science teachers to introduce more challenging material that gradually builds on what students already know and develop learning material that may provide opportunities for enrichment or deeper exploration into topics that intrigue students, preparing them for more advanced classes.

Keywords: *Pedagogical Approaches, Academic Grit, Concept Mastery, Learning Package*

INTRODUCTION

For a couple of decades, much debate has centered on what and how to teach school science. Many educators agree that science teaching methods often reflect a variety of instructional strategies grounded in constructivist learning theory. From this perspective, learning is seen as an active process. A deep constructivist view suggests that knowledge cannot simply be transferred from one person to another—it must be personally constructed by the learner (Bruce, 2020).

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Pedagogical approaches in science focus on developing both scientific knowledge and attitudes, clearly indicating that the teacher plays a central role as the primary agent of change within the school (Park et al., 2019). In contrast, an educational tendency grounded in "evidence" often consumes teachers' time monitoring, testing, and recording, rather than meaningful instruction (Carvajal, et al., 2025). This often leads to a routine-centered teaching approach rather than one grounded in reflective practice.

In addition, academic grit refers to the perseverance to pursue a long-term goal despite academic challenges, sustained through consistent interest and effort. Grit has been identified as a significant predictor of academic success and achievement. According to Hines et al. (2019), grit is associated with academic productivity, motivation, achievement, learning strategies, goal orientations, and student retention. It also influences engagement with challenging tasks, time spent studying, and the pursuit of higher education. Grit Theory, introduced by Duckworth et al. (2007), highlights the role of sustained effort and perseverance toward long-term academic goals, positioning academic grit as a critical factor in student achievement. In recent years, grit has increasingly been viewed as a strong predictor of both school achievement and overall life success.

Consequently, one of the key indicators of successful learning in natural science is students' level of concept mastery. Mastery of natural science concepts is achieved when students can simplify or abstract material, interpret it, and apply it in real-life contexts (Cherif et al., 2016). Mastery contributes to the emergence of student creativity by enabling learners to generate new ideas and solutions that are applicable to their daily lives (Muńoz & Sanchez, 2023). As Roy (2016) emphasized, the level of student creativity varies depending on their experience and prior knowledge.

One significant challenge in teaching science is the inability of students to properly define and internalize concepts, often because the ideas presented in textbooks and by teachers are not aligned with their understanding. Additionally, students' lack of persistence in pursuing challenging academic goals is compounded by the demanding curriculum, which includes more than eight subjects at the junior high school level. These challenges underscore the importance of utilizing effective teaching materials and pedagogical approaches that promote self-directed learning, student engagement, higher-order thinking, and conceptual understanding (Baumert et al., 2010; Salendab, et al., 2023).

A learning package in Science 8 refers to the instructional design, delivery, and assessment strategies utilized within the Science 8 curriculum that emphasize the development of academic grit. It also serves as proof of students' academic accomplishment and capability in Science 8. In this study, pedagogical approaches and academic grit were considered the independent variables, while concept mastery in Science 8 was the dependent variable. Additionally, a learning package was developed as the output of the study to serve as supplementary material aimed at enhancing pedagogical approaches, academic grit, and concept mastery among Grade 8 students.

Recent shifts in educational frameworks have called for more integrative and student-centered learning models, particularly in science education. As countries move toward 21st-century learning goals, there is a growing emphasis on cultivating essential life skills such as critical thinking, collaboration, and perseverance—skills that are deeply connected to both pedagogy and grit (Saavedra & Opfer, 2012). By embedding these values into science instruction, educators can better equip students to navigate not only academic challenges but also real-world problems.

Moreover, the integration of pedagogical approaches and academic grit into the design of learning packages provides a holistic framework for addressing current gaps in student performance and engagement. Studies have shown that combining cognitive and non-cognitive skill development leads to more meaningful learning outcomes and sustained academic progress (Farrington et al., 2012). This study acknowledges the pressing need for evidence-based interventions that address both the cognitive and non-cognitive needs of learners. Through the development and implementation of a structured learning package in Science 8, this research seeks to contribute to the body of knowledge aimed at improving science education outcomes in the school setting.

Research Questions

This study was conducted to assess the level of pedagogical approaches, academic grit, and concept mastery in science among grade 8 students in the Division of Aklan, which is the basis for the learning package for the school year 2024-2025

Specifically, the study sought to answer the following questions:

1. What is the level of pedagogical approaches of science teachers as a whole and in terms of constructivist, collaborative, reflective, integrative, and inquiry-based approaches as perceived by Grade 8 students in the Division of Aklan?
2. What is the level of academic grit in science of Grade 8 students in the Division of Aklan?

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3. What is the level of concept mastery in Science of Grade 8 students in the Division of Aklan?
4. Is there a significant difference in concept mastery among the levels of pedagogical approaches as perceived by Grade 8 students in the Division of Aklan?
5. Is there a significant difference in concept mastery among the levels of academic grit of Grade 8 students in the Division of Aklan?
6. Are there significant relationships among pedagogical approaches, academic grit, and concept mastery in science among Grade 8 students in the Division of Aklan?
7. Are there significant predictors of concept mastery between the pedagogical approaches and academic grit in science of Grade 8 students in the Division of Aklan?
8. What learning package can be created based on the result of the study?

Hypothesis

Based on the statement of the problem mentioned above, the following hypotheses were tested:

1. There is no significant difference in concept mastery among the levels of pedagogical approaches as perceived by Grade 8 students in the Division of Aklan.
2. There is no significant difference in concept mastery among the levels of academic grit of Grade 8 students in the Division of Aklan.
3. There are no significant relationships among pedagogical approaches, academic grit, and concept mastery in science among Grade 8 students in the Division of Aklan.
4. Level of pedagogical approaches and academic grit are not significant predictors of concept mastery in science 8 among the Grade 8 students in the Division of Aklan.

METHODS

Research Design

This survey-correlational research study was conducted to assess the level of pedagogical approaches, academic grit, and concept mastery in Science among Grade 8 students in the Division of Aklan, which was the basis for the Learning Package in Science 8. A survey-correlational study was utilized as the quantitative research method. A survey is a structured approach to gathering data from individuals, enabling the development of quantitative descriptions of the broader population to which they belong (Munck, 2017). Meanwhile, a correlational study aims to determine the significance of differences or relationships between variables (Alonzo et al., 2015).

Population and Sampling

The participants of this study were the Grade 8 students in the Division of Aklan, SY 2024-2025. Using Raosoft's sample size calculator, 369 out of 8915 Grade 8 students participated in this study. Furthermore, stratified random sampling was used to determine the sample size in each of the schools in every District.

Additionally, they were selected at random using stratified proportional sampling.

Instrumentation

In this study, a set of questionnaire checklists was utilized to collect relevant information. The data for the study were gathered using a combination of researcher-made tests and a checklist questionnaire, which were self-administered. The questionnaire consisted of four (4) parts. Part I, determined the Level of Pedagogical Approaches in Science Questionnaire. Part II, was the level of Academic Grit Questionnaire, and Part III, was the Concept Mastery in Science 8 Test.

For the pedagogical approaches in science and the academic grit questionnaire, the following scoring procedure was used:

Rating	Range	Verbal Interpretation
5	4.21 – 5.00	Very Highly Evident
4	3.41 – 4.20	Highly Evident
3	2.61 – 3.40	Moderately Evident
2	1.81 – 2.60	Less Evident
1	1.00 – 1.80	Least Evident

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On the concept mastery in science test, the mean was arbitrarily categorized as follows:

Mean Score	Verbal Interpretation
28.01 – 35.00	Advanced
21.01 – 28.00	Proficient
14.01 – 21.00	Approaching Proficiency
7.01 – 14.00	Developing
0.00 – 7.00	Beginning

Data Collection

The following procedures were made in gathering the necessary data. The researcher first secured approval from Filamer Christian University, Inc., and the Department of Education, Division of Aklan, along with letters of support from school heads to facilitate the study. After approval, consent forms were distributed to students through their teachers. These forms were signed by the students' parents or guardians and then collected by the researcher. An orientation was held for both science teachers and students to explain the purpose of the study, the ethical guidelines involved, and the potential benefits of participating. Afterward, the researcher personally administered the questionnaires during science classes, ensuring that students understood how to respond accurately. Completed questionnaires were retrieved, coded, and analyzed using SPSS software. The quantitative data were used to determine students' levels of pedagogical approaches, academic grit, and concept mastery in science, which will be the basis for developing the learning package for science 8.

Treatment of Data

The data obtained was t analyzed and interpreted to derive the study's results. The following statistical tools were applied to analyze the data gathered for each statement of the problem:

1. Mean and standard deviation were used to determine the level of Pedagogical Approaches.
2. Mean and standard deviation were used to determine the level of Academic Grit.
3. Mean and standard deviation were used to determine the level of Concept Mastery in Science.
4. Analysis of variance (ANOVA) was used to determine the significant difference of Concept Mastery among the levels of Pedagogical Approaches.
5. Analysis of variance (ANOVA) was used to determine the significant difference of Concept Mastery among the levels of Academic Grit.
6. Pearson r was used to determine the significant relationship among Pedagogical Approaches, Academic Grit and Concept Mastery in Science.
7. Regression analysis was used to determine whether Pedagogical Approaches and Academic Grit in Science are predictors of Concept Mastery.

Ethical Considerations

The following ethical guidelines were observed for the research period:

1. Protected the dignity and wellbeing of participants at all times.
2. The researcher obtained the participants' permission to use their responses in the research report.
3. Confidentiality was ascertained to the respondents adhering to Republic Act 10173 or the Data Privacy Act of 2012.

RESULTS AND DISCUSSION

This part presents the tabulated data of the study with corresponding analysis and interpretation.

The presentation of the significant findings followed the sequence of the statement of the problem. This presentation is divided into two parts: (1) Descriptive Data Analysis, and (2) Inferential Data Analysis. The first part, Descriptive Data Analysis, presents the descriptive data along with their analysis and interpretation, while the second part, Inferential Data Analysis, presents the inferential data together with their corresponding analysis and interpretation. Data necessary for this study were gathered using researcher-made, adopted, and modified questionnaires. To analyze the data, the statistical tools employed included mean, standard deviation, Pearson r, and regression analysis.

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Level of Pedagogical Approaches of Science Teachers

Table 1 below shows that the level of pedagogical approaches of science teachers as perceived by Grade 8 students in the Division of Aklan.

Table 1

Mean and Standard Deviation of Pedagogical Approaches

Variable	Mean	Description	SD
Pedagogical Approaches	4.18	Highly evident	0.35
Constructivist Approach	4.33	Very highly evident	0.40
Collaborative Approach	4.18	Highly evident	0.43
Reflective Approach	4.22	Very highly evident	0.41
Integrative Approach	3.94	Highly evident	0.50
Inquiry-Based Approach	4.22	Very highly evident	0.45

The overall result indicates that most students perceive the use of pedagogical approaches in their science classes as "highly evident." This suggests that most of science teachers consistently employ a diverse range of instructional strategies to facilitate learning.

The high rating reflects the integration of various teaching methods that support student engagement and understanding in science. This diversity in pedagogical approaches allows for more effective knowledge transfer, catering to different learning styles and enhancing the overall learning experience in the classroom.

Moreover, the result also suggests that among the pedagogical approaches, constructivism is the most frequently and effectively used in their science classes. This reflects the success of this approach in fostering an environment where students are encouraged to be active participants in their learning process, thus making it the most prominent in their educational experience.

The result of the study supports the statement of Dailey (2016), the approach of constructivism is based on the concept of constructivism. This is the belief that learners, through experience via their natural lives while growing, create their understanding of the things around them. People transform the information they have gathered into knowledge and a certain understanding using specific experiences. This approach encourages learners to take a more active role in the learning process, enabling them to use prior knowledge as a foundation for understanding new concepts and helping them avoid passively receiving information.

Level of Academic Grit in Science of Grade 8 Students

Table 2 presents the mean and standard deviation results of the level of academic grit in science of Grade 8 students in the Division of Aklan.

Table 2

Mean and Standard Deviation of Academic Grit

Variable	Mean	Description	SD
Academic Grit	4.10	Highly evident	0.38

The result presents a "highly evident" level of academic grit, which means that Grade 8 students show perseverance, effort and a determined mindset in their studies. Most of the students are committed to managing their time, persisting through challenging tasks and homework, and seeking help and guidance when needed.

Grade 8 students also demonstrate a strong belief in their ability to improve academically through consistent effort and practice. They recognize the importance of learning from mistakes and setting personal goals to achieve academic success.

Moreover, most students exhibit a positive attitude toward balancing academics, extracurricular activities, and even self-care. They view and recognize the long-term value of education and understand how their actions directly impact academic outcomes.

The finding of the study agrees with the results of De Vera et al. (2015), which found that social support is a key component of passion and perseverance toward personal and work-related goals. As program participants wrote, "Academic grit is long-term" and "emphasizes steadfastness and perseverance." The authors asserted that grit is related

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to "the ability to continue, commitment to growth, consistency, determination, drive to succeed, firmness, passion to excel, and personal commitment."

Level of Concept Mastery in Science of Grade 8 Students

Table 3 shows the mean and standard deviation results of the level of concept mastery in science of Grade 8 students in the Division of Aklan.

Table 3

Mean and Standard Deviation of Concept Mastery in Science

Variable	Mean	Description	SD
Concept Mastery	20.04	Approaching proficiency	5.26

The "Approaching Proficiency" level of concept mastery among Grade 8 students in the Division of Aklan may be attributed to the complexity of the science topics covered, including types of forces, Newton's laws of motion, energy, components of visible light, heat and temperature, and current and voltage.

These topics often involve abstract concepts—such as forces and energy transformations—which require students to visualize processes that are not directly observable, making them difficult to comprehend. Additionally, topics like current, voltage, and energy require the application of mathematical relationships, which can be challenging for students who are still developing problem-solving skills in mathematics.

Many teachers and schools in the Division of Aklan also face limited resources, time constraints, and large class sizes, which hinder their ability to provide the hands-on experiential learning opportunities necessary for students to fully grasp these topics. Without opportunities to engage in practical experiments, the abstract nature of these concepts becomes even more difficult for students to understand and apply.

The result of the study is consistent with the findings of experimental study of Ridho et al. (2013), which showed that during the second cycle at the second meeting, students' mastery of science concepts was 24.13%, categorized as low, with an average learning score being 67.03, classified as medium.

Significant Difference in Concept Mastery among the Levels of Pedagogical Approaches in Science of Grade 8 Students

Table 4 below shows the Analysis of variance result of the difference in concept mastery among the levels of pedagogical approaches in science of Grade 8 students in the Division of Aklan.

Table 4

Analysis of Variance of Concept Mastery Among the Levels of Pedagogical Approaches

Source of Variation	SS	df	MS	F	Sig.
Between Groups	135.4	2	67.7	2.469^{ns}	0.086
Within Groups	10037	366	27.4		
Total	10172	368			

* $p<0.05$ significant @ 5% alpha level
ns $p>0.05$ not significant @ 5% alpha level

The results indicate that there is no significant difference in concept mastery across the levels of pedagogical approaches as perceived by Grade 8 students. This finding suggests that students' understanding of key science concepts—such as types of forces, Newton's laws of motion, energy, visible light, heat and temperature, and current and voltage—does not significantly differ based on the pedagogical approach used by teachers, according to student perceptions.

Teachers often use a blend of pedagogical approaches in their classrooms, combining elements of collaborative, integrative, and inquiry based methods. This blended approach may blur the distinctions between teaching styles, making it difficult for students to perceive a clear impact of one approach over another.

The outcome of this study is consistent with the findings of Kinos et al. (2021), whose focus on early childhood education pedagogy while different teaching approaches—such as interaction-based or scaffolded pedagogy—may

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offer varied experiences, they do not consistently lead to significantly different outcomes in children's concept mastery across diverse pedagogical methods.

Significant Difference in Concept Mastery among the Levels of Academic Grit of Grade 8 Students

Table 5 presents the Analysis of variance on the difference in concept mastery among the levels of academic grit of Grade 8 students in the Division of Aklan.

Table 5

Analysis of Variance of Concept Mastery Among the Levels of Academic Grit

Source of Variation	SS	df	MS	F	Sig.
Between Groups	93.05	2	46.5	1.689^{ns}	0.186
Within Groups	10079	366	27.5		
Total	10172	368			

* p<0.05 significant @ 5% alpha level
ns p>0.05 not significant @ 5% alpha level

The results suggest that regardless of whether students exhibit low, moderate, or high levels of academic grit, their mastery of essential science concepts remains consistent. This consistency indicates that grit alone may not be a decisive factor in how well students understand scientific concepts.

Mastery of scientific concepts often requires not only persistence but also effective teaching methods that promote conceptual understanding. Additionally, achieving this mastery demands high levels of cognitive engagement. Students must go beyond mere memorization of facts; they need to integrate and apply their knowledge across various contexts to truly grasp the material.

The result of the study is consistent with the findings of Rojas et al. (2020), who investigated the impact of grit on academic performance among high school students. The results showed that while students exhibited varying levels of grit, there were no significant differences in their mastery of core academic concepts, suggesting that grit alone does not predict academic success in terms of concept mastery.

Significant Relationships among Pedagogical Approaches, Academic Grit, and Concept Mastery in Science among Grade 8

Table 6 depicts the Pearson r result about the relationships among pedagogical approaches, academic grit, and concept mastery in science among Grade 8 students in the Division of Aklan.

Table 6

Pearson r Among Pedagogical Approaches, Academic Grit and Concept Mastery

Variables	r	Sig
Pedagogical Approaches and Academic Grit	0.531*	0.000
Pedagogical Approaches and Concept Mastery	(-)0.147*	0.005
Academic Grit and Concept Mastery	(-)0.107*	0.040

* p<0.05 significant @ 5% alpha level
ns p>0.05 not significant @ 5% alpha level

As to the relationship between pedagogical approaches and academic grit, the results suggest that the way teachers engage with their students can have a profound impact on their resilience and determination to succeed, especially in challenging subjects like science.

In addition, when teachers adopt engaging and relevant methods, they create an environment that not only captures students' attention but also encourages them to invest effort into their studies. Interesting and meaningful lessons increase student engagement, and engaged students tend to put in more effort and are less likely to give up when faced with obstacles.

On the other hand, students with high levels of grit demonstrate resilience by viewing challenges as opportunities for growth rather than insurmountable obstacles, allowing them to maintain their motivation and commitment even in the face of adversity. This ability to recover from setbacks not only enhances their academic performance but also fosters a lifelong love of learning, as they learn to embrace difficulties as integral parts of their educational experience.

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The findings are consistent with the study by Hodge et al. (2017), which states that pedagogical approaches fostering exploration, challenge, and support significantly improve students' grit, which in turn positively influences their academic engagement and performance. Furthermore, the results indicate that while grit is a valuable trait for academic achievement, its effectiveness is moderated by the type of educational environment and teaching methods employed. These insights contribute to a deeper understanding of grit as a critical factor in educational outcomes and highlight the need for educators to adopt strategies that cultivate this essential quality in students.

Predictors of Concept Mastery based on Pedagogical Approaches and Academic Grit in Science among Grade 8 Students

Table 7 presents the regression analysis results whether pedagogical approaches and academic grit in science are predictors of concept mastery among Grade 8 students in the Division of Aklan.

Table 7

Regression Analysis of Concept Mastery Based on Pedagogical Approaches and Academic Grit

Variables	Unstandardized Coefficients B	Standardized Coefficients Beta	T	Sig.
(Constant)	30.294		8.453	0.000
Pedagogical Approaches	-1.911	-0.125	(-)2.058*	0.040
Academic Grit	-0.554	-0.04	(-)0.657^{ns}	0.511

* $p<0.05$ significant @ 5% alpha level
ns $p>0.05$ not significant @ 5% alpha level

When pedagogical approaches are a predictor of concept mastery, this suggests that students' understanding of scientific concepts can be influenced by the teaching methods employed in the classroom.

The results of the study also indicate that as concept mastery increases, there may be a corresponding decrease in the effectiveness of certain pedagogical approaches. This could suggest that traditional teaching methods may not adequately support students in achieving mastery of complex concepts. For instance, if a teacher relies heavily on lecture-based instruction without incorporating interactive elements or opportunities for student participation, students may struggle to connect with the material, ultimately hindering their understanding.

The result of the study is parallel to the findings of Ma (2018), which emphasizes that strong concept mastery can lead to more effective learning experiences when paired with an appropriate teaching strategy.

Learning Package in Science

The learning package for Grade 8 students, based on the study's results, integrates a comprehensive approach to science education that combines hands-on experimentation, teamwork, critical thinking, and real-life applications. The package focuses on key science concepts such as Newton's laws of motion, heat and temperature, and energy, with an emphasis on developing academic grit, concept mastery, and scientific inquiry.

By employing a combination of constructivist, collaborative, reflective, inquiry-based, and integrative pedagogical approaches, the package encourages active participation, problem-solving, and persistence in the face of challenges. Students are given opportunities to conduct experiments, reflect on real-life scenarios, and connect their learning to everyday experiences. The activities and assessments are designed to help students build resilience and deepen their understanding, while fostering critical scientific skills necessary for success in both academic and real-world contexts.

Lesson Topic	Objectives	Learning Approaches Integrated	Activities
Forces and Newton's Laws of Motion	1. Identify and describe types of forces. 2. Demonstrate Newton's Laws.	Constructivist Approach: Hands-on experimentation. Collaborative Approach: Group work for experiments.	Activity 1: Identifying Forces (Identify forces on a moving car). Activity 2: Newton's Laws Experiment (Explore the 3 laws through experiments).

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	3. Reflect on real-world applications.	Reflective Approach: Self-reflection. Inquiry-Based Approach: Exploration of solutions. Integrative Approach: Real-life applications.	
Heat and Temperature	1. Define heat and temperature. 2. Explain heat transfer methods (conduction, convection, radiation). 3. Apply academic grit to overcome challenges.	Academic Grit: Perseverance through challenges in experiments. Hands-On Exploration: Heat transfer experiments. Collaborative: Group reflection and data sharing.	Activity 1: Heat Transfer Experiment (Explore conduction through metal rods). Activity 2: Reflection on Academic Grit (Reflect on challenges faced in experiments).
Energy	1. Define energy and its importance. 2. Identify and explain energy forms (kinetic, potential, thermal, chemical, electrical). 3. Explain energy transformation.	Hands-On Learning: Energy transformation experiments. Collaborative: Group discussions. Reflective: Analyzing energy transformations in real-life examples.	Activity 1: Identifying Types of Energy (Categorize different types of energy). Activity 2: Energy Transformation Chart (Create examples of energy transformation in everyday life).

Conclusion

Based on the findings of the study stated above, the following conclusions were drawn:

1. The Grade 8 students perceived the level of pedagogical approaches in their science classes as "highly evident," suggesting that teachers should maintain clear, structured instruction and consistently communicate learning objectives. This approach supports the development of students' active learning skills through engaging methods like group discussions, experiments, and problem-solving activities, which may enhance their learning success.
2. The level of academic grit in science among Grade 8 students in the Division of Aklan was found to be "highly evident," indicating that students are intrinsically motivated, proactive in their learning, and set personal academic goals, especially in challenging subjects like science. This perseverance and problem-solving mindset can better prepare them for future success in STEM education and careers.
3. The Grade 8 students' concept mastery in science was found to be approaching proficiency, and their content knowledge level was moderate. This suggests that while students have a basic understanding of scientific concepts, they may struggle with deeper application. To address this, teachers can introduce more challenging and enriching materials that build on existing knowledge and encourage independent exploration, helping students gain confidence and prepare for more advanced learning.
4. The absence of a significant difference in concept mastery across levels of pedagogical approaches suggests that factors beyond teaching methods—such as student motivation, individual learning needs, and assessment strategies—may play a more critical role. This highlights the need for personalized learning experiences and the integration of active learning strategies like group discussions, problem-based learning, and student-led projects to enhance student engagement and content mastery.
5. The absence of a significant difference in concept mastery among the levels of academic grit of Grade 8 students suggests that all students—regardless of initial perseverance—can benefit from structured support,

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iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

confidence-building strategies, and a growth-focused classroom. Teachers play a key role in nurturing grit by celebrating effort, normalizing mistakes, and encouraging persistence through challenges.

6. The study revealed significant relationships between pedagogical approaches, academic grit, and concept mastery in Science among Grade 8 students in the Division of Aklan. These findings provide valuable benchmarks for assessing the effectiveness of teaching methods and inform the development of targeted interventions to support students' academic success. By refining teaching strategies and fostering student perseverance, educators can better assist learners in mastering challenging science concepts.
7. The study found that pedagogical approaches significantly predicted concept mastery, whereas academic grit did not. This suggests that the way Science is taught plays a more crucial role in student understanding than individual perseverance alone. The findings highlight the importance of responsive teaching—where instructional strategies are tailored to learners' assessed needs—to enhance concept mastery and improve overall learning outcomes in science.
8. The developed learning package in science has the potential to enhance both learner and teacher mastery of the subject, thereby improving competency outcomes. Furthermore, it fosters greater collaboration in addressing challenges within the teaching-learning process. By allowing for tailored instruction that adapts to the individual needs, learning styles, and abilities of students, the learning package can significantly support personalized learning. Ultimately, this approach aligns with the goal of providing equitable, culturally-responsive, and comprehensive quality education for all students.

Recommendations

Based on the findings and conclusions, the following recommendations were suggested:

1. Teachers are encouraged to implement structured, clear, and engaging instructional methods. Active learning strategies such as group discussions, experiments, and problem-solving activities should be used to enhance students' science learning experiences and overall academic success. Learners, on the other hand, should recognize and make full use of these teaching methods by organizing regular study sessions, reviewing class notes daily, and utilizing supplemental resources like online tutorials and educational videos to reinforce learning.
2. School administrators should support and encourage continuous professional development for teachers by organizing workshops, seminars, and training sessions on innovative and inclusive teaching practices. Teachers, in turn, should foster perseverance in their students by creating a supportive classroom environment where effort is celebrated, and challenges are framed as opportunities for growth. Special attention should be given to encouraging students who may be struggling to develop grit and academic resilience.
3. Teachers are advised to provide more opportunities for students to engage in higher-order thinking activities, such as problem-solving tasks and scientific inquiry. Provide constructive feedback that promotes growth and resilience, focusing on effort, improvement, and the strategies used rather than just the outcome.
4. Learners should adopt active learning strategies to strengthen their grasp of scientific concepts. Explaining complex topics to peers, relating content to real-life experiences, and using interactive educational tools such as apps and simulations can enhance retention and understanding. Teachers should also tailor instruction by using formative assessments to understand students' individual learning needs, applying differentiated strategies to close learning gaps and improve concept mastery.
5. Teachers should regularly use quizzes, class activities, and discussions to assess students' comprehension of key concepts. The results of these assessments should inform the modification of lesson plans and provide a basis for offering personalized feedback and support. School administrators must ensure that classrooms are equipped with modern science textbooks, interactive learning platforms, and laboratory materials to support experiential and inquiry-based learning.
6. School administrators should promote both effective pedagogy and the development of student grit by training teachers not only in instructional techniques but also in strategies that foster a growth mindset. Parents are encouraged to create a supportive home environment that nurtures curiosity and exploration by discussing science topics at home, watching educational content together, or visiting science-related venues to stimulate student interest.
7. Teachers are encouraged to continually refine their instructional strategies to better enhance conceptual understanding. Professional development should focus on evidence-based methods that promote active

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learning, critical thinking, and student engagement. Additionally, future researchers may build on this study by exploring different variables or populations to further investigate the dynamics between pedagogical approaches, grit, and concept mastery.

Future researchers may utilize this study as a basis for their future studies. A replicate of this study may be conducted utilizing different variables for further data collection and investigation.

8. School administrators should consider implementing the developed learning package as part of their curriculum to support both students and teachers. The learning package should be tailored to accommodate different learning styles and needs, offering a flexible approach to content delivery. Additionally, ongoing teacher training on how to effectively use the package will be essential for maximizing its impact on student mastery.

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